CERVICAL COLLAR

FIELD OF THE INVENTION

The present invention generally relates to a collar, i.e., a cervical collar adapted to airway maintenance with cervical spin control. More specifically, the present invention relates to a jaw thrusting cervical collar adapted to maintain airway device introduce to the patient at the very first step of a trauma treatment.

BACKGROUND OF THE INVENTION

The human spine comprises some vertebrae grouped into three sections according to location: cervical spine (neck), thoracic spine (middle back), and lumbar spine (lower back). Soft tissues, including ligaments, muscles, and skin, surround and support the spine. Seven of the vertebrae form the cervical spine connecting the base of the head to the thorax (trunk and shoulders) and supporting the head.

In the practice of emergency medicine and the treatment of trauma, when damage to the cervical spine in suspected, there is often a need to secure the head and neck of a patient, to prevent movement of the cervical spine vertebrate and deterioration of the patient's condition. Spinal cord damage can result in partial or complete paralysis or even death.

Cervical collars are a common protective device well known in the medical art. In the treatment of spinal cord damage it is common to perform x-ray or similar imaging of the damaged area. Therefore cervical collars are often made of materials transparent to x-rays. Cervical collars are additionally often required to be lightweight and comfortable, and also to be cheap and easy to manufacture.

Furthermore, in the practice of emergency medicine and the treatment of trauma it is common for a patient to loose consciousness and the ability to maintain open airways and respiration. Loss of respiration is often fatal. There are several methods known in the art

for maintaining open airways. One invasive technique is surgical cricothyroidotomy involving the insertion of a tube through the neck of the patient.

There is therefore a need simultaneously to protect the spine and maintain open airways, as both conditions, damage to the spine and suffocation, are highly damaging, often fatal, and usually irreversible. Therefore there is a need for cervical collars to enable opening of the airways. It is thus common for cervical collars to comprise a hole or an opening in the region of the front of the neck to allow invasive techniques such as surgical cricothyroidotomy.

There are techniques known in the art for maintaining open airways by maintaining an open mouth. Being less invasive than perforating the neck, they are usually preferable. However, the need to open the mouth of a patient tends to conflict with the requirement of maintaining a rigid position of the head to prevent damage to the spine. There are techniques known in the art for opening the mouth while minimizing other motion of the head. Such techniques include several variations on the jaw thrust maneuver. Existing cervical collars tend to interfere with the execution of such techniques, and none assist such non-invasive techniques.

The following is a list of variations of cervical collars and similar devices. Some describe means for enabling circulation of air around the neck, some comprise a hole or an opening in the region of the of the neck, but none describe means for opening the mouth in order to maintain open airways into the lungs.

Various patent show means for immobilizing the head of injured patients. Hence, US Pat No. 5,048,509 to Grundei *et al.* discloses a cervical support that has an inherently stable support body of elastic foam material, and a jaw support regions which extend symmetrically and in mirror image relationship with respect to an imaginary longitudinal axis connecting the centers of the nape support region and the chin support region. This collar constructed from two parts adapted to be mutually assembled rigidly, without effective means of maneuvering mandibular-clasping members of the collar. Similarly, US Pat No. 5,785,058 to Reynolds teaches a disposable head and neck immobilization device allows reducing contamination hazard from transfer of bodily fluids. The

mandibular is effectively fastened by means of said collar, yet airway maintenance is not provided.

Lastly, US Pat No. 5,682,632 to Cotroneo presents a head rest device for use under a patient's head, the device comprising a base and a jaw thrust support having at least two protuberances extending upward from the upper surface of the base for engaging with the patient's mandible at angles of the mandible so that the patient's mandible is thrust out distracting the patient's tongue and associated structures in a direction away from the patient's head and neck, and in so doing, opening the patient's oropharynx and hypopharynx and lifting the patient's epiglottis out from in front of the patient's laryngeal inlet. A portable cervical collar adapted to providing trauma patient treated in the field and transferred to hospital an airway maintenance with cervical spin control, is yet not available and thus meets a long felt need.

SUMMARY OF THE INVENTION

It is thus the core of the present invention to provide a medical device that simultaneously performs two conflicting functions, the first function is to protect the neck by restricting the movement of the head against the rest of the body, and the second function is to prevent suffocation by maintaining an open path by which air may flow to the lungs in the least invasive way possible.

It is hence in the scope of the present invention a cost effective cervical collar useful for maintaining the airways in head and neck immobilized trauma patient open. Said collar comprising *inter alia* a rigid motion- restricting frame attached to the head; and a jaw clasp attached to the jaw. Its novelty is generally characterized by that it is simultaneously restricting the motion of the head and neck while allowing motion of the jaw to maintain open airways.

It is further in the scope of the present invention wherein the aforementioned collar additionally comprising a restrictor member restricting the motion or location of the jaw clasp relative to the rigid frame; and/or wherein the restrictor limits the distance between

the rigid frame and the jaw clasp and/or wherein the restrictor limits the direction of motion between the rigid frame and the jaw clasp.

It is further in the scope of the present invention wherein the aforementioned collar additionally comprising a lock member preventing the motion of the jaw clasp relative to the rigid frame.

It is another object of the present invention to present a jaw clasp, generally useful for performing the jaw-thrust maneuver motion of the jaw to maintain open airways. This novel collar comprising a plurality of *n* movable fitting elements adapted to fit the jaw tightly; and a plurality of *n* movable mover elements adapted to move the jaw, wherein *n* is an integer number between 1 to 8, preferably 2 or 4. Alternatively or additionally, the jaw clasp may comprise a cervical collar adapted to immobilized head and neck of trauma patients. Additionally, the collar may comprise a restrictor restricting the motion or location of the mover elements relative to the cervical collar and/or a lock member preventing the motion of the mover elements relative to the cervical collar. Preferably, the restrictor may limit the distance between the fitting elements and the cervical collar; and/or the direction of motion between the fitting elements and the cervical collar.

It is lastly another object of the present invention to present a useful method for performing the jaw-thrust maneuver wherein the patient is immobilized with a cervical collar; wherein the jaw of the patient is fitted with a clasp and further wherein the clasp is allowed to move along a restricted path. Said method comprising the following steps:

- fitting the patient with a cervical collar;
- fitting the patient with a jaw clasp;
- using the jaw clasp to perform the jaw-thrust maneuver;

and wherein the step of fitting the cervical collar comprises steps of fitting various parts of which the cervical collar is assembled.

BRIEF DESCRIPTION OF THE INVENTION

In order to understand the invention and to see how it may be implemented in practice, a plurality of embodiments will now be described, by way of non-limiting example only, with reference to the accompanying drawings, typical dimensions are sometimes appended to the drawing as an example only, such that those who are skilled in the art may understand the described embodiment better:

Figure 1 schematically presents major components of the present invention by function rather than by form; it depicts the function of major components in relation to the head of a patient, rather than their preferred shape and exact location in relation to the head; the head is depicted as composed of two units: the jaw 110, and the rest of the head 100; the component of the present invention whose function is to attach to the jaw is depicted as block 210; the component of the present invention whose function is to aid in moving block 210 and thus jaw 110 is depicted as block 290; the components of the present invention whose function is to control and direct the (-forward) movement of blocks 210 and 290 are depicted as blocks 250 and 260; block 240 describes the attachment of blocks 250 and 260 to rigid block 230; the function of the other blocks 220, 230, 240, 270 and 280 is to attach to the head (blocks 270 and 280) e.g., by a means of a strip, compose a rigid structure (block 230), and control the motion of the head in relation to the rest of the body of the patient (block 220);

Figure 2 describes a preferred procedure for the use of a preferred embodiment of the present invention, an embodiment comprising essentially 3 parts;

Figure 3 schematically presents a situation in which the present invention is of practical use; a patient is depicted by head 310, jaw 360 and airways 320; the patient is depicted as being handled in order to open airways 320, and in particular head 310 is depicted as being undesirably moved along arrow 350, and the jaw is being lifted;

Figure 4 schematically presents the forces applied on a jaw (400) as it is being forced open against resistance of the muscles; various arrows depict the direction of forces extracted by various muscles, the sum of which is depicted by a pair of lines 410; an external pair of forces directed to open the jaw in attachment to its two sides is

two sides is depicted as a pair of lines 420, and a single force directed to open the jaw in attachment to the chin is depicted as line 430;

Figure 5 schematically presents a structural part of a preferred embodiment of the present invention marked as part 500; part 500 is designed to be located at the back of the head of the patient, and to attach to the head; it comprises rigid parts (510 and 530), soft parts and attachment components: attachment to head 550, attachment to front 540, attachment to jaw related parts 590, and attachment to the rest of the body of the patient, 560;

Figure 6 schematically presents a structural part of a preferred embodiment of the present invention marked as part 600; part 600 is designed to be located at the front of the neck of the patient, and to support to the head, while allowing the airways to be opened by use of hole 610 and groove 620;

Figure 7 schematically presents a structural part of a preferred embodiment of the present invention marked as part 700; part 700 is designed to be attached to the jaw in a fitting fashion; it comprises parts that can move in relation to each other and then lock in position; parts 710 (left and right) fit the back of the jaw, and parts 720 (left and right) fit the front of the jaw;

Figure 8A, Figure 8B and Figure 8B schematically present some structural parts of a preferred embodiment of the present invention involved in the movement of the jaw; strap or straps 820 move the pair of elements 810 forward through connecting element 830;

Figure 9 schematically presents an element of a preferred embodiment providing the function of limiting the location of other moving elements; it is denoted as block 260;

Figures 10A, 10B, 10C, 11, etc. through Figure 28 are a set of detailed technical drawings instructing a person skilled in the art how to manufacture a preferred embodiment of the present invention;

Figures 10A, 10B, 10C, 11, etc. through Figure 17 provide a detailed disclosure of the part labeled as 500 in reference to Figure 5;

Figure 10A schematically presents the assembly of part 500;

Figure 10B schematically presents part 500 when fully assembled;

Figure 10C comprises a table listing various elements of part 500 and disclosing their quantities;

Figure 11 schematically presents part 500 along with its preferred dimensions;

Figure 12 and 13 details a pair of elements of part 500 that is collectively labeled 530;

Figure 14 schematically presents an element of part 500 that is labeled 510;

Figure 15 schematically presents a pin;

Figure 16 schematically presents a nut;

Figure 17 schematically presents a hook;

Figures 18A, 18B, 18C, 19, 20 and 21 provide a detailed disclosure of elements described in reference to Figures 8A, 8B and 8C;

Figure 18A schematically presents the assembly of elements around part 600;

Figure 18B schematically presents the same elements when fully assembled;

Figure18C comprises a table listing various elements and disclosing their quantities;

Figure 19 schematically presents part 600 along with its dimensions;

Figure 20 and 21 details a pair of elements that are collectively labeled 810;

Figures 22A, 22B, 22C, 23A, 23B, 24A, 24B, 25A, 25B, 26A, 26B, 27 and 28 provide a schematically detailed disclosure of part 700 described in reference to Figure 7.

Figure 22A schematically presents the assembly of part 700;

Figure 22B schematically presents the same elements when fully assembled;

Figure 22C comprises a table listing various elements and disclosing their quantities;

Figure 23A, 23B, 24A and 24B schematically presents a pair of elements collectively labeled 720;

Figure 25A, 25B, 26A and 26B schematically presents a pair of elements that are collectively labeled 710;

Figure 27 schematically presents an element for a locking rail;

Figure 28 schematically presents a nail;

Figure 29 schematically presents cervical collar comprising a 'jaw thrust'-like knob according to one embodiment of the present invention;

Figure 30 schematically presents 'Chin lift' collar according to one embodiment of the present invention;

Figure 31 schematically details both lifted chin conformation of lever and its un-lifted chin conformation; and,

Figure 32 schematically presents another embodiment of the present invention, wherein a maxillary support is provided.

DETAILED DESCRIPTION OF THE INVENTION

The following description is provided, alongside all chapters of the present invention, so as to enable any person skilled in the art to make use of said invention and sets forth the best modes contemplated by the inventor of carrying out this invention. Various modifications, however, will remain apparent to those skilled in the art, since the general principles of the present invention have been defined specifically to provide protection to the neck by restricting the movement of the head against the rest of the body, and

simultaneously to provide means of maintaining an open path through which air may flow to the lungs.

The term 'airway' refers in the present invention to any passage for a current of air into or out of the lungs.

The term 'collar' refers in the present invention to any device comprised of parts wrapped around the neck.

The term 'jaw-thrust maneuver' refers in the present invention to a technique to open an airway by placing fingers behind the angle of a jaw of a patient, usually fingers of one hand on each side, and displacing the mandible forward; said technique is usually used when said patient may have a cervical spine injury. The same term is also used in the present invention to the same technique applied by mechanical devices rather than fingers.

Terms relating to direction, such as 'up' and 'forward' refer in the present invention to directions defined herein below in reference to Figure 2.

The term 'ABS' specifically refers in the present invention to a plastic material named Acrylonitrile Butadiene Styrene, yet more generally related to any thermoplastic polymer composition, adapted to be molded easily and cost-effectively.

The airway marinating cervical collar according to the most general embodiment of the present invention, is schematically characterized by a rigid frame protecting the head and neck, while restricting their relative motion one against the other, and simultaneously providing means to prevent suffocation by maintaining the patient's airways open by enabling the movement of the jaw.

According to one embodiment of the present invention, the enabled movement of the jaw is essentially in the forward direction, and to a minor extent in a downward direction, as is normally the case in the jaw-thrust maneuver.

According to another embodiment of the present invention the enabled movement of the jaw is both in the forward direction and in a downward direction.

According to yet another embodiment of the present invention the position of the jaw can be fixed when the jaw is located in a desired position.

According to one embodiment of the present invention a rigid structure is formed essentially of one collar wrapped around the head and neck.

According to another embodiment of the present invention a rigid structure is formed essentially of several parts connected together to fit a specific patient.

According to one embodiment of the present invention a rigid structure is formed by avoiding any holes or dents in its form that are not essential.

According to another embodiment of the present invention holes or dents allow access to the ears of the patient.

According to another embodiment of the present a invention holes or dents allow access to the front of the neck of the patient.

Reference is now made to Figure 1, presenting a schematic and generalized presentation of the aforementioned novel airway maintaining cervical collar.

Figure 1 schematically presents major components of the present invention by function rather than by form. It depicts the function of major components in relation to the head of a patient, rather than their preferred shape and exact location in relation to the head. The head is depicted as composed of two units: the jaw 110, and the rest of the head 100. The present invention provids the benefit of allowing jaw 110 to move in relation to head 100. This movement is preferably in a forward and slightly downwards direction. By allowing this motion the present invention allows an open airway to be maintained through the open mouth and to the lungs. The component of the present invention whose function is to attach to the jaw is schematically depicted as block 210. Details of how this function is provided are disclosed, inter alia, in reference to Figure 7. The component of the present invention whose function is to aid in moving block 210 and thus cause the movement of jaw 110 is schematically depicted as block 290. Details of how this function is provided are disclosed, inter alia, in reference to Figure 7 and Figure 8A. The components of the present invention whose function is to control and direct the movement of blocks 210 and

290 are schematically depicted as block 250 and block 260. Block 250 directs the movement relative to head 100 and also prevents motion when it is not desired, usually when the jaw is already positioned in the desired position relative to the head, usually when it is open and allowing the passage of air. Details of how this function is provided are disclosed, inter alia, in reference to Figure 8A, Figure 8B, and Figure 8C. Block 260 prevents block 210 from wandering too far from the rest of the parts of the present invention, as may happen at times when block 210 is not attached the jaw. It is acknowledged in this respect that optional block 260 may be constructed as a rubber strip, adapted to be attached at the right and/or left side of the collar, and is especially adapted to support block 210. Details of how this function is provided are disclosed, inter alia, in reference to Figure 9. Block 240 performs the function of attaching blocks 250 and 260 to rigid block 230. Details of how this function is provided are disclosed, inter alia, in reference to Figure 5. Blocks 270 and 280 perform the function of attachment to the head 100. Two blocks are schematically depicted to show that the attachment can be made at one or more locations.

Attachment to the head is limited in form, composition and location by many considerations including the following:

- the jaw should be kept free to move,
- the mouth should not be blocked,
- the nose should not be blocked,
- the ears should not be blocked to sound or for diagnosing presence of either blood or CF adjacent to the ear,
- the eyes should not be blocked to light,
- attachment should be soft and comfortable, and must not inflict injury,
- attachment should not be permanent.

A preferred embodiment of the present invention provides a solution meeting all of the above-mentioned considerations by providing at least one attachment to the head that is

located at the temples and forehead. Details of this preferred embodiment are described in reference to Figure 5. Various components of the present invention provide a rigid mechanical structure represented by block 230. Details of how this function is provided are disclosed, inter alia, in reference to Figure 5.

Various components of the present invention restrict the motion of the head in relation to the rest of the body of the patient. Details of how this function, represented by block 220, is provided are disclosed, inter alia, in reference to Figure 6.

Figure 3 schematically presents a situation in which the present invention is of practical use. A patient is depicted by head 310, jaw 360 and airways 320. The patient is depicted as being handled in order to open airways 320, and in particular, head 310 is depicted as being moved undesirably along arrow 350, while the jaw is being lifted. It is a benefit of the present invention that it restricts the movement of the head, while enabling the movement of the jaw.

Figure 4 schematically presents the forces applied on a jaw, generally denoted by the numeral 400, as it is being forced open against resistance of the muscles. Various arrows depict the direction of forces extracted by various muscles, the sum of which is depicted by pair of lines 410. An external pair of forces directed to open the jaw in attachment to its two sides is depicted as pair of lines 420, and a single force directed to open the jaw in attachment to the chin is depicted as line 430. A first preferred embodiment of the present invention applies forces denoted by 420, and a second preferred embodiment of the present invention applies forces denoted by 430.

Figure 5 schematically presents a structural part of a preferred embodiment of the present invention marked as part 500. Part 500 is designed to be located at the back of the head of the patient, and to attach to the head. It is an advantage of this preferred embodiment that this elongated part 500 is located at the back, where it does not interfere with the functions of the eyes, nose, ears or mouth. Part 500 comprises the following rigid elements. Rigid element 510 is located at the back. A preferred embodiment for element 510 is disclosed herein below in reference to Figure 14. Rigid elements located at the sides are collectively marked as 530. A preferred embodiment for element 530 is

disclosed herein below in reference to Figure 11 and Figure 12. Alternative designs may be provided by persons skilled in the art, which employ rigid elements of varying shape and number to the same effect. Part 500 comprises soft elements providing comfort for the patient and avoiding injury. A preferred embodiment for soft elements is disclosed herein below in reference to Figure 11. Part 500 comprises attachment elements as follows. An attachment element to the head is denoted by 550. In a preferred embodiment of the present invention it has roughly the shape of a part of an oval or a circle fitting the shape of the back of the head. In one embodiment of the present invention it is directly or permanently attached to the head by forehead strip and/or by other chemical or physical means.

A usually more desirable preferred embodiment does not employ such means, but comprises straps connecting to element 550 and wrapped around the forehead. Such straps are detailed herein below in reference to Figure 10A. Part 500 comprises attachment element to the front 540, which attaches to the frontal parts of the present invention. Part 500 comprises attachment element to jaw related parts 590, which perform the function desired in reference to elastic block 240, e.g., a strip member in Figure 1. A preferred embodiment for element 590 is disclosed herein below in reference to Figure 17. Part 500 comprises attachment element to the rest of the body of the patient denoted by 560. The concentric circles depicted in Figure 5 in relation to element 560 denote the generally round shape of this element in a preferred embodiment of the present invention.

Figure 6 schematically presents a structural part of a preferred embodiment of the present invention marked as part 600. Part 600 is designed to be located at the front of the neck of the patient, and to support to the head, while allowing the airways to be opened by use of hole 610 and groove 620. Part 600 is essentially round to fit the shape of the neck. Groove 620 represents the essential feature in the present invention of allowing for movement of the jaw. Groove 620 is located just below the jaw. A first embodiment of the present invention lacks hole 610 to provide additional rigidity. A second embodiment of the present invention comprises hole 610 to allow cricothyroidotomy.

Figure 7 schematically presents a structural part of a preferred embodiment of the present invention marked as part 700. Part 700 is designed to be attached to the jaw in a fitting fashion. It comprises elements that can move one in relation to the other and then lock in position. A detailed disclosure of part 700 and its elements is provided herein below in reference, inter alia, to Figure 30A. Element 710 (left and right) fits the back of the jaw, and elements 720 (left and right) fit the front of the jaw. These elements can move one in relation to another. When part 700 is fitted to a specific jaw of a specific patient these elements are first moved so that a separating distance is created between them, then part 700 is placed under the jaw, and finally the elements of part 700 are moved so as to minimize the distance between them and thus achieve a tight fit to the jaw. Figure 7 depicts a preferred embodiment of the present invention in which extrusion 750 provides the function of applying force and causing forward movement as described in reference to block 290 in Figure 1. Preferably, 750 represents a pair of such extrusions at both sides of the jaw. Another embodiment of the present invention applies the forces denoted as 430 in reference to Figure 4. It is acknowledged in this respect that aforementioned ingredients of the collar may be selected from elastic or non-elastic materials or any combination thereof (e.g., rigid members comprising elastic portions and *vis versa*).

Figure 8A, Figures 8B and Figure 8C schematically present some structural parts of a preferred embodiment of the present invention restricting and/or immobilizing the movement of the jaw. Strap or straps 820 move a pair of elements 810 forward through connecting element 830.

These elements perform the function described in reference to block 250 in Figure 1.

Figure 8A shows element 600 described herein above in reference to Figure 6, and the placement of elements 810 in relation to it.

Figure 8B schematically describes a situation in which the jaw is being opened. Part 700 described in reference to Figure 7 is moved, and is not essentially in contact with element 810.

Figure 8C schematically describes a situation in which the jaw is being locked open. Part 700 described in reference to Figure 7 essentially comes in contact with element 810, as

element 810 is moved forward. A preferred embodiment of element 810 whose shape allows the movement described herein is disclosed in reference to Figure 22 and Figure 23.

Referring again to Figure 8A, straps 820 secure element 810 in a jaw locking position when the movement terminates.

Figure 9 schematically presents an element of a preferred embodiment providing the function of limiting the location of other moving elements. It is marked as block 260 in Figure 1. Block 260 comprises an elastic band or strap, a ribbon, a string, a chain or essentially any flexible element attached to element 590 described in reference to Figure 500 on one side, and to any location with in part 700 described in reference to Figure 7 on another side.

Figure 2 describes a preferred procedure for the use of a preferred embodiment of the present invention, an embodiment comprising essentially three parts: an anterior part as described in reference to Figure 8A, a posterior part as described in reference to Figure 5, and a jaw clasp as described in reference to Figure 7. The procedure assumes an unconscious patient lying down, face up, as depicted in Figure 3. Nevertheless, the terms front, back, up and down are used herein as if the patient was standing up, so for example, the posterior part can be said to be normally placed behind the anterior part rather the below it.

The procedure is as follows:

First, fit the posterior part by placing the posterior part behind the head of the patient, and shifting (2025) the part to the anatomically best fitting location. The part is preferable flexible to the extent that it may be folded (2010) and then straightened (2020) so that it is inserted (2015) behind the head of the patient without any need to move the head. Attach (2030) the part to the head by means of its attachment elements. One such attachment element is described herein below in reference to element 550 in Figure 5. Attachment is preferably done above the eyes of the patient.

Second, fit the anterior part in front of the neck of the patient (2035), and attach it to the posterior part (2040). One such attachment element is described herein below in reference to element 540 in Figure 5. Make sure (2045) the two parts form a tight fitting frame on the one hand, and that the patient is not being suffocated on the other hand. From this moment (2100) onwards, the anterior and posterior parts are referred to as one unified part and called the frame. From this moment onwards the invention is performing one of its two main functions, that of protecting the cervical spine.

Third, fit the jaw clasp. Enlarge it by displacing (2050) its elements, such elements as described herein below in reference to Figure 7, so that the part becomes as large as possible. Connect (2055) the jaw clasp to the frame by elements described herein in reference to block 260 in Figure 1; and retract (2060) elements of the frame that are normally in contact with the jaw clasp, elements described herein in reference to block 250 in Figure 1, so that said elements do not obstruct the placement of said jaw clasp.

Fit the part tightly to the jaw (2065), essentially reversing step 2050, and lock the tight fitting position of the elements of the jaw clasp. In a preferred embodiment of the present invention locking is achieved by means of a Velcro™-like strap described in reference to Figure 30A herein below.

The invention is now fully assembled in place and ready to perform its other main function, that of opening the jaw or locking it in position (2200).

In a first embodiment of the present invention the invention is used to assist in performing the jaw-thrust maneuver. This essentially forward motion of the jaw is performed by moving elements described in reference to block 250 in Figure 1 forward. This motion is described herein below in reference to Figure 8B. Locking the jaw is described in reference to element 820 in Figure 8B.

In a second embodiment of the present invention the invention is also used to lock the jaw in an open position after a downward movement. This action is described in reference to Figure 8C. Thus ends the procedure.

Figures 10A, 10B, 11, etc through Figure 28 are a set of detailed technical drawings instructing a person skilled in the art how to manufacture a preferred embodiment of the present invention. These drawings are supplied so as to provide for a disclosure of the present invention that is full and detailed. However, the present invention is not limited to the exact shape, dimensions or materials disclosed in these figures.

Figures 10A, 10B, 10C, 11, 12, 13, 14, 15, 16 and 17 provide a detailed disclosure of the part labeled as 500 in reference to Figure 5 as follows.

Figure 10A shows the assembly of part 500. The figure shows various elements labeled 1 to 10, which are further described in the following figures. Elements labeled 8 and 9 comprise attachment straps made, for example, of Polypropylene. Strap 9 attaches to itself by means such as Velcro™-like tape. Strap 9 provides a preferred embodiment for element 530 as described in reference to Figure 5. Strap 8 provides a preferred embodiment for element 540 as described in reference to Figure 5.

Element labeled 10 in Figure 10A is a loop around which strap 9 is laced in assembly.

Figure 10B shows part 500 when fully assembled.

Figure 10C comprises a table listing various elements of part 500 and disclosing their quantities, how many elements of each kind are required to assembled part 500.

Figure 11 shows part 500, labeled 1 in Figure 10A, along with its dimensions. The dimensions are suitable for an average patient, but different dimensions may suit different patients. One material suitable for making this element is plastazote foam, a type of polyethylene. This material is preferred as being soft, comfortable, lightweight, cheap, easy to mold to preferred shape, and transparent to X-ray radiation.

Figure 12 and 13 details a pair of elements of part 500 that is collectively labeled 530 in reference to Figure 5. Figures 12 and 13 disclose 12 in a non-limiting manner one possible exact shape and dimensions for one embodiment of these elements. There is one such element, labeled 2 in Figure 10A, fitted to the left of part 500, which is depicted in Figure 12, and there is one such element labeled 3 in Figure 10A, fitted to the right of part 500, which is depicted in Figure 13.

Figure 14 describes an element of part 500 that is labeled 510 in reference to Figure 5 and 4 in Figure 10A. One material suitable for making element 510 and element 530 is ABS (Acrylonitrile Butadiene Styrene). This material is preferred for being rigid, light-weight, cheap, easy to mold to preferred shape, and transparent to X-ray radiation.

Figure 15 describes a pin, labeled 5 in Figure 10A, suitable for connecting soft or flexible elements of part 500. One material suitable for making this element is ABS.

Figure 16 describes a nut, labeled 6 in Figure 10A, suitable for connecting to the pin labeled 5 described in reference to Figure 15. One material suitable for making this element is ABS.

Figure 17 describes a hook, labeled 7 in Figure 10A. Its function is described as element 590 in reference to Figure 5. One material suitable for making this element is ABS.

Figures 18A, 18B, 18C, 19, 20 and 21 provide a detailed disclosure of elements described in reference to Figures 8A, 8B and 8C as follows.

Figure 18A shows the assembly of elements around part 600 described in reference to Figure 6. The figure shows various elements labeled 1 to 9, which are further described in the following figures. Element labeled 7 comprises a strap similar but complementary to element labeled 8 in Figure 10A. Strap 7 of Figure 18A and strap 8 of Figure 10A connect and attach to each other by means such as Velcro™-like tape to provide the connection between part 600 and part 500 of the present invention. Element labeled 8 comprises a strap similar to element labeled 9 in Figure 10A. This strap is a preferred embodiment of element 820 described in reference to Figure 8A Nails labeled as 4 are preferably made of plastic materials are connecting straps to other rigid elements of this assembly. Loop labeled 9 connected to other parts by these nails is a preferred embodiment of element 830 described in reference to Figure 8.

Figure 18B shows the same elements when fully assembled.

Figure 18C comprises a table listing various elements described in Figure 18A and disclosing their quantities per one unit of assembled part of the present invention.

Figure 19 shows part 600, labeled 1 in Figure 18A, along with its dimensions. The dimensions are suitable for an average patient, but different dimensions may suit different patients. It is made from materials similar to those of part 500 as described in reference to Figure 11.

Figure 20 and 21 details a pair of elements that are collectively labeled 810 in reference to Figure 8A. Figures 20 and 21 disclose the exact shape and dimensions for one embodiment of these elements. There is one such element, labeled 2 in Figure 18A, fitted to the left of part 600, which is depicted in Figure 12, and there is one such element labeled 3 in Figure 18A, fitted to the right of part 600, which is depicted in Figure 13. In reference to Figure 20 and 21 it is evident how the shape of elements 810 allow them to slide backwards or forwards as schematically depicted in Figure 8C.

Figures 22A, 22B, 22C, 23A, 23B, 24A, 24B, 25A, 25B, 26A, 26B, 27 and 28 provide a detailed disclosure of part 700 described in reference to Figure 7 herein above.

Figure 22A shows the assembly of part 700. The figure shows various elements labeled 1 to 10, which are further described in the following figures. Elements labeled 8 and 9 are similar in form and function to corresponding elements described in reference to Figure 10A and Figure 18A. Element labeled 7 provides a preferred embodiment of element 260 described in reference to Figure 1, and implemented by means of a rubber band. Element labeled 10 is not shown as it would obscure other elements. It is comprised of soft sponge like padding covering the assembled part for comfort and prevention of injury.

Figure 22B shows the same elements when fully assembled, and depicts how they may be moved one in relation to another.

Figure 22C comprises a table listing various elements described in Figure 22A and disclosing their quantities per one unit of assembled part of the present invention.

Figure 23A, 23B, 24A and 24B detail a pair of elements that are labeled 1 and 2 in Figure 22A and collectively labeled 720 in reference to Figure 7. Figures 23A, 23B, 24A and 24B disclose in a non-limiting manner one possible exact shape and dimensions for one embodiment of these elements. The right element is depicted in Figure 23A and Figure

23B, and the left element is depicted in Figure 24A and 24B. These elements are preferably made of material such as that described in reference to Figure 14.

Figure 25A, 25B, 26A and 26B detail a pair of elements that are labeled 3 and 4 in Figure 22A and collectively labeled 710 in reference to Figure 7. Figures 25A, 25B, 26A and 26B disclose the exact shape and dimensions for one embodiment of these elements. The right element is depicted in Figure 25A and Figure 25B, and the left element is depicted in Figure 26A and 26B. These elements are preferably made of material such as that described in reference to Figure 14.

Figure 27 details an element labeled 5 in Figure 22A for a locking rail on which other elements move one in respect to another. It is preferably made of material such as that described in reference to Figure 14.

Figure 28 details a nail labeled 6 in Figure 22A for attaching straps to other parts of the assembly. It is preferably made of material such as that described in reference to Figure 14.

Reference is made now to figure 29-32 presenting a plurality of further embodiments according to the present invention, described and defined hereinafter assembled view of the novel cervical collar.

Figure 29 details a cervical collar comprising a 'jaw thrust'-like knob maneuvering the mandible according to yet one embodiment of the present invention. Said jaw thrust is provided by a means of an adjustable knob (1290) comprising an inside portion facing the angels of the mandible as holding points and an outside portion maneuverable by the care giver.

The inside portion comprising a rest (291) and a bolt (292), such that an accommodating-pushing groove (293) is provided. The accommodating-pushing groove (293) is adapted to concurrently accommodating the mandible angle while pushing it anteriorly towards the direction of the chin, i.e., in the opposite direction of cervical spin.

The outside portion comprising adjustable knob (295) moving reversibly along recess (294) and is in communication with the inside portion by means of a pin (296). Said pin

(296) and knob (295) is freely moving anteriorly (i.e., frontally) in recess (294) such that the care giver can fix it in the recess such that the mandible is pushed anteriorly enough to ensure open airway, then the pin (296) is securable fastened by any fastening means, such as screws, claspers, fasteners, fetters, handcuffs-like members etc. The anchoring of the knob, after it was fixed at the right location, is against the collar. The posterior part of the collar is composed of stiff material (such plastic), which according to another embodiment of the present invention can be adjustable to the patent by getting change around some pivot.

It is further in the scope of the present invention wherein the caregiver steps are (a) fixing the collar on the patient, then executing the jaw thrust maneuver, (b) using the knob to push the mandible angle, wherein the push of the knob is carried by the thumbs while the index fingers are leaning on the patent's Zygoma (maxilla), and (c) repeating the same maneuvers as the caregiver would do if he did a jaw thrust maneuver without using the collar.

Figure 30 details a cervical collar comprising a 'Chin lift' collar according to yet one embodiment of the present invention wherein holding point is the chin, gum, or any other member of the oral cavity (1316). The chin lift is holding the chin and then pushing it anterirly while it is being supported on the sternal bone, the maxilla, the zygoma or any other ingredients of the collar. Said lever comprising rear portion (1310) and frontal portion (1312). Said frontal portion includes said 'chin lift' lever (1314) in communication with belt (1313) by means of hinge (1315). Lever (1314, 1314a) is adapted for a lifting the chin (1316) and the mandible thereof.

Figure 31 details both lifted chin conformation of lever (1314, 1314a) and its un-lifted chin conformation. It is acknowledged in this respect that more embodiments of the 'chin lift" lever are possible. Hence, it is in the scope of the present invention wherein lever (1314, 1314a) is adapted to grasp body portion (1316) and push it upwardly/antriorly.

Figure 32 details another embodiment of the present invention, wherein a maxillary support is provided. Said device comprising anchoring belt (3220) and two claspers (3221) adapted for concurrently accommodating the angles of the mandible as holding points, while pushing it anteriorly towards the direction of the chin. The fixation of the

belt at the right location is accomplished in the same way as in the aforesaid 'jaw thrust' embodiment, or by fixing the belt (3220) and two claspers (3221) in there required position.